

**Notice of Allowability**

Application No.

09/694,452

Examiner

Chuong D. Ngo

Applicant(s)

BRADY ET AL.

Art Unit

2193

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to papers filed on 06/08/2005.
2. ☒ The allowed claim(s) is/are 1-3,5-16,18-27,29-39 and 41-48.
3. ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
  - a) ☐ All b) ☐ Some\* c) ☐ None of the:
    1. ☐ Certified copies of the priority documents have been received.
    2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
    3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

\* Certified copies not received: \_\_\_\_\_.


Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.

**THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.**

4. ☐ A SUBSTITUTE OATH OR DECLARATION must be submitted. Note the attached EXAMINER'S AMENDMENT or NOTICE OF INFORMAL PATENT APPLICATION (PTO-152) which gives reason(s) why the oath or declaration is deficient.
  5. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
    - (a) ☐ including changes required by the Notice of Draftsperson's Patent Drawing Review (PTO-948) attached
      - 1) ☐ hereto or 2) ☐ to Paper No./Mail Date \_\_\_\_\_.
    - (b) ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date \_\_\_\_\_.
- Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).
6. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

**Attachment(s)**

1. ☐ Notice of References Cited (PTO-892)
2. ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3. ☐ Information Disclosure Statements (PTO-1449 or PTO/SB/08), Paper No./Mail Date \_\_\_\_\_
4. ☐ Examiner's Comment Regarding Requirement for Deposit of Biological Material
5. ☐ Notice of Informal Patent Application (PTO-152)
6. ☒ Interview Summary (PTO-413), Paper No./Mail Date \_\_\_\_\_
7. ☒ Examiner's Amendment/Comment
8. ☐ Examiner's Statement of Reasons for Allowance
9. ☐ Other \_\_\_\_\_

  
Chuong D. Ngo  
Primary Examiner  
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### **EXAMINER'S AMENDMENT**

An examiner's amendment to the record appears below. Should the changes and/or additions be unacceptable to applicant, an amendment may be filed as provided by 37 CFR 1.312. To ensure consideration of such an amendment, it MUST be submitted no later than the payment of the issue fee.

Authorization for this examiner's amendment was given in a telephone interview with Applicant's representative, David W. Lynch, on August 31, and September 2, 2005.

The application has been amended as follows:

#### **In the Specification**

page 1, line 8, "having attorney docket no. BLD9-2000-0059US1" has been replaced by

- - application No. 09/694,448, filed on 10/23/2000, now U.S. Pat. No. 6,766,341- -.

page 1, line 8, "having attorney docket no. BLD9-2000-0064US1" has been replaced by

- - application No. 09/694,455, filed on 10/23/2000- -.

**In the Claims**

The following is a complete listing of the claims that have replaced all prior claims in the application:

1. (Currently Amended) A method for generating a faster discrete cosine transform in a data compression system, comprising:
  - arranging discrete cosine transform equations into collections, wherein at least one collection includes at least two discrete transform equations, and wherein the at least two discrete transform equations includes at least two discrete cosine transform constants;
  - scaling the discrete cosine transform equations in a collection by dividing each of the discrete cosine transform constants in the collection by one discrete cosine transform constant from the collection;
  - representing each of the scaled discrete cosine transform constants with sums of powers-of-2, wherein the sums of powers-of-2 are calculated to approximate the scaled discrete cosine transform constants; and
  - compressing data using the approximated scaled discrete cosine transform constants;
  - wherein the discrete cosine transform constant chosen for scaling the discrete cosine transform equations in the at least one collection is selected according to a predetermined cost function.
2. (Original) The method of claim 1 further comprising separating an image into at least one block and transforming the block into transformed data by performing matrix multiplication on the discrete cosine transform equations based upon binary arithmetic using the estimated scaled discrete cosine transform constants and performing linear shifts and additions.
3. (Original) The method of claim 1 wherein the scaling the discrete cosine transform equations in the at least one collection by dividing each of the discrete cosine

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transform constants in the at least one collection by one of the discrete cosine transform constants from the at least one collection saves multiplications.

4. (Canceled)
5. (Currently Amended) The method of claim [[ 4 ]] 1, wherein the cost function minimizes a number of add operations.
6. (Currently Amended) The method of claim [[ 4 ]] 1, wherein the cost function minimizes a worst case number of add operations.
7. (Currently Amended) The method of claim [[ 4 ]] 1, wherein the cost function minimizes an error per constant resulting from the approximations.
8. (Original) The method of claim 2 wherein the transforming the block into transformed data further comprises using at least one set of one dimensional discrete cosine transform equations.
9. (Original) The method of claim 8 wherein the discrete cosine transform constants are obtained by splitting the discrete cosine transform constants into even and odd terms by obtaining sums and differences of input samples.
10. (Original) The method of claim 2 wherein the block is an  $N_1 \times N_2$  block.
11. (Original) The method of claim 10 wherein  $N_1 = N_2 = 8$ .
12. (Currently Amended) A data compression system, the data compression system comprising a discrete cosine transformer for applying a discrete cosine transform to decorrelate data into discrete cosine transform equations, the discrete cosine transform equations having been formed by arranging discrete cosine transform equations into collections, wherein at least one collection includes at least two discrete transform equations,

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and wherein the at least two discrete transform equations includes at least two discrete cosine transform constants, scaling the discrete cosine transform equations in a collection by dividing each of the discrete cosine transform constants in the collection by one discrete cosine transform constant from the collection and representing each of the scaled discrete cosine transform constants with sums of powers-of-2, wherein the sums of powersof-2 is calculated to approximate the scaled discrete cosine transform constants;

wherein the discrete cosine transform constant used for scaling the discrete cosine transform equations in the at least one collection is selected according to a predetermined cost function.

13. (Original) The data compression system of claim 12 further comprising a quantizer for quantizing the transformed data into quantized data to reduce the number of bits needed to represent the transform coefficients.

14. (Original) The data compression system of claim 12 wherein the discrete cosine transformer further separates an image into at least one block and transforms the block into transformed data using the discrete cosine transform equations based upon binary arithmetic using the estimated scaled discrete cosine transform constants and performing linear shifts and additions.

15. (Original) The data compression system of claim 12 wherein the transformer executes equations that save multiplication operations, the equations having been formed by scaling the discrete cosine transform equations in the at least one collection by dividing each of the discrete cosine transform constants in the at least one collection by one of the discrete cosine transform constants from the at least one collection.

16. (Original) The data compression system of claim 15 further comprising an entropy encoder for further compressing the quantized coefficients losslessly.

17. (Canceled)

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18. (Currently Amended) The data compression system of claim [[ 17 ]] 12, wherein the cost function minimizes a number of add operations.
19. (Currently Amended) The data compression system of claim [[ 17 ]] 12, wherein the cost function minimizes a worst case number of add operations.
20. (Currently Amended) The data compression system of claim [[ 17 ]] 12, wherein the cost function minimizes an error per constant resulting from the approximations.
21. (Original) The data compression system of claim 12 wherein discrete cosine transformer uses at least one set of one dimensional discrete cosine transform equations.
22. (Original) The data compression system of claim 12 wherein the equations split the discrete cosine transform coefficients into even and odd terms by obtaining sums and differences of input samples.
23. (Original) The data compression system of claim 14 wherein the block is an  $N_1 \times N_2$  block.
24. (Original) The data compression system of claim 23 wherein  $N_1 = N_2 = 8$ .
25. (Currently Amended) A printer, comprising:
  - a memory for storing data;
  - a processor for processing the data to provide a compressed print stream output; and
  - a print head driving circuit for controlling a print head to generate a printout of the data;wherein the processor applies a discrete cosine transform to decorrelate data into transform coefficients using discrete cosine equations, the discrete cosine transform equations having been formed by arranging discrete cosine transform equations into collections, wherein at least one collection includes at least two discrete transform equations, and wherein the at least two discrete transform equations includes at least two discrete cosine transform constants, scaling the discrete cosine transform equations in a collection by dividing each of

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the discrete cosine transform constants in the collection by one discrete cosine transform constant from the collection and representing each of the scaled discrete cosine transform constants with sums of powers-of-2, wherein the sums of powers-of-2 is calculated to approximate the scaled discrete cosine transform constants;

wherein the discrete cosine transform constant used in scaling the discrete cosine transform equations in the at least one collection is selected according to a predetermined cost function.

26. (Original) The printer of claim 25 wherein the processor further separates an image into at least one block and transforms the block into transformed data by performing matrix multiplication on the discrete cosine transform equations based upon binary arithmetic using the estimated scaled discrete cosine transform constants and performing linear shifts and additions.

27. (Original) The printer of claim 25 wherein the processor executes equations that save multiplication operations, the equations having been formed by scaling the discrete cosine transform equations in a collection by dividing each of the discrete cosine transform constants in the at least one collection by one of the discrete cosine transform constants from the at least one collection.

28. (Canceled)

29. (Currently Amended) The printer of claim [[ 28 ]] 25, wherein the cost function minimizes a number of add operations.

30. (Currently Amended) The printer of claim [[ 28 ]] 25, wherein the cost function minimizes a worst case number of add operations.

31. (Currently Amended) The printer of claim [[ 28 ]] 25, wherein the cost function minimizes an error per constant resulting from the approximations.

32. (Original) The printer of claim 25 wherein processor uses at least one set of one dimensional discrete cosine transform equations.

33. (Original) The printer of claim 32 wherein the processor splits the discrete cosine transform coefficients into even and odd terms by obtaining sums and differences of input samples.

34. (Original) The printer of claim 26 wherein the block is an  $N_1 \times N_2$  block.

35. (Original) The printer of claim 34 wherein  $N_1 = N_2 = 8$ .

36. (Currently Amended) An article of manufacture comprising a program storage medium readable by a computer, the medium tangibly embodying one or more programs of instructions executable by the computer to use equations created by a method for generating faster discrete cosine transforms, the method comprising:

arranging discrete cosine transform equations into collections, wherein at least one collection includes at least two discrete transform equations, and wherein the at least two discrete transform equations includes at least two discrete cosine transform constants;

scaling the discrete cosine transform equations in a collection by dividing each of the discrete cosine transform constants in the collection by one discrete cosine transform constant from the collection; and

representing each of the scaled discrete cosine transform constants with sums of powers-of-2, wherein the sums of powers-of-2 are calculated to approximate the scaled discrete cosine transform constants;

wherein the discrete cosine transform constant chosen for scaling the discrete cosine transform equations in the at least one collection is selected according to a predetermined cost function.

37. (Original) The article of manufacture of claim 36 further comprising separating an image into at least one block and transforming the block into transformed data

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by using discrete cosine transform equations based upon binary arithmetic using the estimated scaled discrete cosine transform constants and performing linear shifts and additions.

38. (Original) The article of manufacture of claim 36 wherein the scaling the discrete cosine transform equations in the at least one collection by dividing each of the discrete cosine transform constants in the at least one collection by one of the discrete cosine transform constants from the at least one collection saves multiplications.

39. (Canceled)

40. (Currently Amended) The article of manufacture of claim [[ 39 ]] 36, wherein the cost function minimizes a number of add operations.

41. (Currently Amended) The article of manufacture of claim [[ 39 ]] 36, wherein the cost function minimizes a worst case number of add operations~.

42. (Currently Amended) The article of manufacture of claim [[ 39 ]] 36, wherein the cost function minimizes an error per constant resulting from the approximations.

43. (Original) The article of manufacture of claim 36 wherein the transforming the block into transformed data further comprises using at least one set of one dimensional discrete cosine transform equations.

44. (Original) The article of manufacture of claim 43 wherein the discrete cosine transform constants are obtained by splitting the discrete cosine transform constants into even and odd terms by obtaining sums and differences of input samples.

45. (Original) The article of manufacture of claim 37 wherein the block is an  $N_1 \times N_2$  block.

46. (Original) The article of manufacture of claim 45 wherein  $N_1 = N_2 = 8$ .

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47. (Currently Amended) A data analysis system, comprising;  
a memory for storing discrete cosine transform equations having been formed by arranging discrete cosine transform equations into collections, wherein at least one collection includes at least two discrete transform equations, and wherein the at least two discrete transform equations includes at least two discrete cosine transform constants, scaling the discrete cosine transform equations in a collection by dividing each of the discrete cosine transform constants in the collection by one discrete cosine transform constant from the collection and representing each of the scaled discrete cosine transform constants with sums of powers-of-2, wherein the sums of powers-of-2 is calculated to approximate the scaled discrete cosine transform constants; and

a transformer for applying the transform equations to perform a discrete cosine transform to decorrelate data into discrete cosine transform coefficients;

wherein the discrete cosine transform constant used for scaling the discrete cosine transform equations in the at least one collection is selected according to a predetermined cost function.

48. (Original) The data analysis system of claim 47 wherein the transformer further separates an image into at least one block and transforms the block into transformed data by using the discrete cosine transform equations based upon binary arithmetic using the estimated scaled discrete cosine transform constants and performing linear shifts and additions.

49. (Canceled)

### **REASON FOR ALLOWANCE**

1. The following is an examiner's statement of reasons for allowance:

The prior art of record does not teach or fairly suggest a discrete cosine transform formed by arranging discrete cosine transform equations into collections, scaling the discrete cosine transform equations in a collection by dividing each of the discrete cosine transform constants in the collection by one discrete cosine transform constant from the collection, wherein the discrete cosine transform constant used in scaling the discrete cosine transform equations in a collection is selected according to a predetermined cost function.

2. Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

3. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Chuong D. Ngo whose telephone number is (571) 272-3731. The examiner can normally be reached on Tuesday-Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Kakali Chaki can be reached on (571) 272-3719. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



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Primary Examiner  
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